26. (new) An edge sharpening device comprising (a) a metal substrate and (b) a ceramic honing surface comprising a ceramic coating on at least part of said metal substrate.
27. (new) The edge sharpening device of claim 26 wherein said metal substrate is aluminum.
28. (new) The edge sharpening device of claim 26 wherein said metal substrate is titanium.
29. (new) The edge sharpening device of claim 26 wherein said honing surface is on a part of said metal substrate which has a contour including at least one of (1) a knurled contour, (2) a V-groove, (3) a triangular contour, (4) a cylindrical contour, or (5) a wheel contour.
30. (new) The edge sharpening device of claim 26 wherein said ceramic coating is from 0.001 inch to 0.012 inch thick.

Remarks

The check attached to the accompanying letter, in the amount of $295.00, includes $44.00 for the additional independent claim and $36.00 for four dependent claims, as well as $215.00 for the extension of time.

Re the rejections under 35USC112, applicant attaches hereto, adopted as part of the present argument, a copy of an internet printout titled "Quality 101: Surface Finish Measurement Basics" by Alex Tabenkin, a consultant on surface finish/form metrology at Mahr Federal, Inc., Providence, Rhode Island. It will be seen that the measurement of surface irregularities and roughness (or smoothness) could involve more than 100 ways to measure a surface and analyze the results, expressed as parameters. The paper goes on to say:

> The most common parameter is Ra, or Arithmetic Average Roughness. It basically reflects the average height of roughness component irregularities from a mean line. Ra provides a simple value for accept/reject decisions. It is a default parameter on a drawing if not otherwise specified, and is available even in the least sophisticated instruments. Ra is not a good discriminator for different types of surfaces as it is incapable of differentiating between "spiky" and "scratched" surfaces having the same Ra. Additional parameters should be specified for this purpose, such as Rp (Maximum Peak Height), Rv (Maximum Valley Depth) and Ry (Maximum Peak-to-Valley Roughness Height).......
>
> Surface finish measurement procedures, general terminology, definitions of most parameters and filtering information can be found in American Standard ASME B46 1 – 2002, Surface Texture, and in International Standards, IOS 4287 and ISO 4288.

Readily available commercial instruments will provide readouts in Ra, which are recognized by persons of ordinary skill in the art and standard throughout industry. Applicants have abundantly described how an electrolytic microarc oxidation process of bonding the ceramic layer to the metal substrate can be used to make a honing surface having the described range of smoothness/roughness. There can be no question of enablement when the measurement of the surface characteristics is understood.

Applicants have discarded the phrase "characterized by" and now use "having" to introduce the surface finish measurement in terms of Ra. It will be seen from the internet article referred to above that Ra, being an arithmetic average, might not be considered strictly a characteristic of the surface itself, but is rather a manifestation of the way the instrument measures the surface, considering several effects – see the diagram on page 3 of the article, where the profiles of the surfaces have the same Ra although they appear to be essentially opposite or reverse. It is submitted that the rejections on both the first and second paragraphs of Section 112 are moot.

The initial rejection under 35USC103 combines Campione et al and Meyer, asserting that it would have been obvious to one skilled in the art to combine the features identified by Examiner, allegedly to obtain applicants' invention. Campione et al's concept is to provide a guide plate/holder for a sharpening stone. The sharpening stone is conventional – see column 3, line 59 et seq. No mention is made of a coating of any kind, either in the passage cited by Examiner or anywhere else in the text. Campione's aluminum guide plate, in Examiner's view, corresponds to applicants' "metal body" even though it is completely separate from the stone. Meyer is cited for his teaching about grain size, and Examiner says that it would have been obvious to use Meyer's teachings to choose a grain size which would yield applicants' smoothness characteristics. But applicant says nothing about grains to be included in the honing surface. See the Background of the Invention, particularly paragraphs 0002 and 0004, reviewing the deficiencies of high-pressure compaction of ceramic slurries or powders with binding material, and of solid ceramic materials, even as relatively coarse embedded grain. Applicants' invention is a hard ceramic coating on a metal substrate, which avoids the problems of monolithic ceramic pieces and, for honing, of embedded particles. Meyer's layer 14 is not a ceramic coating as required by applicant's claims, and no combination of his teachings with those of Campione could lead to applicants' invention. Newly submitted claims 26-30 also recite the invention in terms not apparent or inferrable from Campione and Meyer. Please note again applicant's paragraph 2026 – grit is not mentioned in the definition of honing, while a grit size range is recited in the definition of abrading.

The first part of the amendment to claim 1 above is intended to emphasize that the coating is a tangible part of the article. A coating is permanently fixed to and adheres to the underlying body, while Campione's device is "easy to assemble and disassemble" (col. 2, line 56 and eleswhere throughout) – the sharpener and the body are readily separable. Examiner does not meet her burden of showing obviousness by reviewing the law about product-by-process claims, while disregarding the requirement in applicants' claims for the presence of a ceramic coating. In any event, claim 1 has been revised to emphasize that the ceramic coating is a tangible, structural limitation of the claim. That tangible limitation is missing from Examiner's combination; there is no suggestion in the references that would lead one to a ceramic coating, and the rejections in Examiner's paragraph 13 should be withdrawn.

In paragraph 14, the Examiner adds the Cozzini reference to Campione and Meyer for a rejection of five claims. The Cozzini reference is said to contribute the dependent claims' limitations, while the Campione and Meyer references are applied in the same manner as in the paragraph 13 rejections. But note that Cozzini's "variety of hardened materials" cited by Examiner do not include ceramic, much less a ceramic <u>coating</u>. This contrived combination still lacks a ceramic coating; Cozzini does not supply the missing ingredient. It is also important to note, with respect to the various shapes, profiles and contours in the dependent claims, that it is a particular virtue of the electrolytic microarc oxidation process of bonding the ceramic layer to the metal substrate that it can create the ceramic coating on various contours, shapes and profiles as described particularly with respect to Figures 6a, 6b, and 6c. Such options are not readily available to others in the art who are working with conventional materials and fabrication processes.

Also, in paragraph 15, five more dependent claims are rejected on the same combination of Campione and Meyer, this time adding Cohen, which is cited for his ceramic rods in a triangular configuration and having rounded edges. But again, the feature of a ceramic <u>coating</u> is missing, there is no motivation provided to apply a ceramic coating <u>to a metal body</u> as required by applicants' claims. Note that Cohen's device, like Campione's is designed to permit easy disassembly so the rods can be rotated (col. 4, lines 39-54). The honing surface is not permanently fixed to the "body" as in applicant's device. This combination does not add up to applicants' invention, nor can it reasonably be inferred therefrom.

Paragraph 16 uses all four references to apply against claims 1-3, 5-11, 18, and 23-25, the Examiner purporting to have assembled in the four references all the limitations of all the various combinations recited in the claims. But, again, the important limitation of a ceramic coating is not present among any of the items collected in the recitations for any set of the claims treated, nor is there any motivation apparent from the

references to combine them in a way which achieves applicants' invention – that is, a product having a ceramic coating for a honing surface.

Referring now to the Examiner's "Response to Arguments" beginning on page 10, it again should be observed that the Examiner (paragraph 18) is dismissing applicants' ceramic coating by invoking the principles of product-by process claims, without having found a ceramic coating applied by <u>any</u> process in the prior art. In order to fulfill the burden of showing unpatentability, it is still necessary for Examiner to show a honing surface coated with a ceramic, or, to use the newly amended language, a "ceramic coating." This comment is appropriate also for paragraphs 20 and 22.

Re paragraph 21, applicants' attorney can see the potential for confusion in our last response. But, to the extent Examiner relies on Cohen's ceramic for the abrading surface, it is unclear how the ceramic is combined with the Campione disclosure. In any event, there is no ceramic <u>coating</u> in either Campione or Cohen.

The above amendment to claim 1 clarifies that the ceramic coating is indeed a tangible, structural limitation. No such element is seen in the references, nor can it be inferred from any suggestions in the references. The rejections should be withdrawn. Newly presented claims 26-30 all include a ceramic coating as a limitation, and in claim 30, recite a thickness limitation for the ceramic coating.

The present status of all claims is appended hereto.

Respectfully submitted,

William L. Krayer

William L. Krayer

Certificate of Mailing (37CFR1.8a)

I hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being deposited with the United States Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to the Commissioner for Patents, PO Box 1450, Alexandria VA 22313-1450.

Date 11/12/04

William L. Krayer

William L. Krayer

(Signature of Person Mailing Paper)

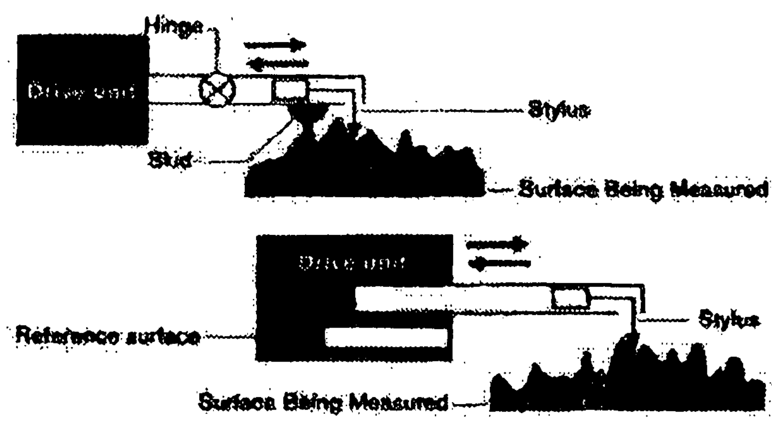
1. [Currently amended] An article useful for edge sharpening comprising a metal body having at least one honing surface <u>comprising a ceramic coating</u> ~~coated with a ceramic~~ created in an electrolytic bath, said honing surface ~~characterized by~~ <u>having</u> a surface finish of Ra 120 to Ra 10.
2. [Original] An article of claim 1 having a handle.
3. [Original] An article of claim 1 wherein said metal body is aluminum.
4. [Canceled]
5. [Original] An article of claim 1 wherein at least one honing surface is substantially flat.
6. [Original] An article of claim 1 wherein at least one honing surface is curved.
7. [Original] An article of claim 1 having a V groove therein.
8. [Original] An article of claim 1 having at least one edge treated in said electrolytic bath to concentrate current thereon while said ceramic coating is created on said surface.
9. [Original] An article of claim 1 including at least one abrading surface.
10. [Original] An article of claim 9 wherein said abrading surface is an abrasive strip affixed to a recess in said article.
11. [Original] An article of claim 10 wherein said abrading surface comprises silicon carbide, diamond or aluminum oxide.
12. [Original] An article of claim 1 having a triangular profile.
13. [Original] An article of claim 7 having a triangular profile.
14. [Original] An article of claim 12 having at least one V groove.
15. [Original] An article of claim 12 having at least one abrading surface.
16. [Previously presented] An article of claim 15 wherein said abrading surface is affixed to a recess in the surface of said article.
17. [Previously presented] An article of claim 15 wherein said abrading surface comprises silicon carbide, diamond, or aluminum oxide.
18. [Original] An elongated sharpening bar comprising a generally rectangular-shaped metal body having attached thereto at least one abrasive strip, the balance of said bar being substantially covered with a ceramic coating created in an electrolytic bath.
19. [Original] Article of claim 8 wherein said edge is rounded.

20. [Withdrawn] Method of making a sharpening device having at least one edge comprising placing a metal incipient sharpening device as an electrode in an electrolytic bath and imposing a modified shaped wave alternating current in said bath.
21. [Withdrawn] Method of claim 20 wherein said modified shaped wave alternating current creates a plasma discharge within said bath, resulting in microarc oxidation on the surface of said incipient sharpening device.
22. [Withdrawn] Method of making a sharpening device comprising forming a hard coating on an incipient sharpening device by (i) immersing the incipient sharpening device in an electrolytic bath comprising a passivating agent and an electrolytic agent, and (ii) passing a modified shaped-wave alternating electric current from a source of 250 to 800 volts through the surface of the incipient sharpening device, wherein the modified shaped-wave electric current rises from zero to its maximum height and falls to below 40% of its maximum height within less than a quarter of a full alternating cycle thereby causing dielectric breakdown and the formation of a ceramic coating on the surface of said incipient sharpening device, and removing the completed sharpening device from the electrolytic bath.
23. [Original] An edge sharpening device comprising an elongated metal body having a ceramic surface on at least two contour portions selected from flat, rounded edge, and tapered.
24. [Original] An edge sharpening device of claim 23 wherein said metal body is aluminum.
25. [Previously presented] An edge sharpening device of claim 23 including at least one of a V groove and an abrasive strip.
26. (new) An edge sharpening device comprising (a) a metal substrate and (b) a ceramic honing surface comprising a ceramic coating on at least part of said metal substrate.
27. (new) The edge sharpening device of claim 26 wherein said metal substrate is aluminum.
28. (new) The edge sharpening device of claim 26 wherein said metal substrate is titanium.
29. (new) The edge sharpening device of claim 26 wherein said honing surface is on a part of said metal substrate which has a contour including at least one of (1) a knurled contour, (2) a V-groove, (3) a triangular contour, (4) a cylindrical contour, or (5) a wheel contour.
30. (new) The edge sharpening device of claim 26 wherein said ceramic coating is from 0.001 inch to 0.012 inch thick.

Quality 101: Surface Finish Measurement Basics

By Material Provided by Alex Tabenkin, consultant on surface finish/form metrology at Mahr Federal, Inc. (Providence, RI)

Posted on: 09/01/2004



In skidded gages, the sensitive, diamond-tipped stylus is contained within a probe, which has a skid that rests on the workpiece. Skidded gages (upper) measure roughness only. Skidless gages (lower) use an internal precision surface as a reference. This enables skidless gages to be used for measurements of waviness and form, in

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addition to roughness. Source: Mahr Federal Inc.

Ever since E.J. Abbot developed the first surface finish tester at the University of Michigan in the 1940s, industry has been aware that roughness is an important characteristic of machined surfaces.

The growing influence of surface finish can be traced to dramatic changes in manufacturing specifications and drastic tightening of dimensional tolerances over the past few decades. As a result of these changes, the proportion of the tolerance range, which is taken up by surface irregularities, has increased from roughly 15% in the 1940s to nearly 50% in some cases today.

Surface geometry is measured for two principle reasons: to try to predict the performance of the machined parts, such as engine pistons and fuel injection parts, and to try to control the manufacturing process.

A surface consists of three basic components: form, waviness and roughness. On a turned part, form is the result of errors in the way the lathe produces a part, commonly known as straightness errors, and waviness is a result of various vibrations, both in the machine tool and from outside sources. Roughness, on the other hand, is the result of feed-rate tool geometry, tool condition, and variations in material and hardness.

There are two general types of

surface-finish measuring systems: "skidded," measuring roughness only, and "skidless," evaluating form, waviness and roughness. In skidded gages, the sensitive, diamond-tipped stylus is contained within a probe, which has a skid that rests on the workpiece. Thus, skidded gages use

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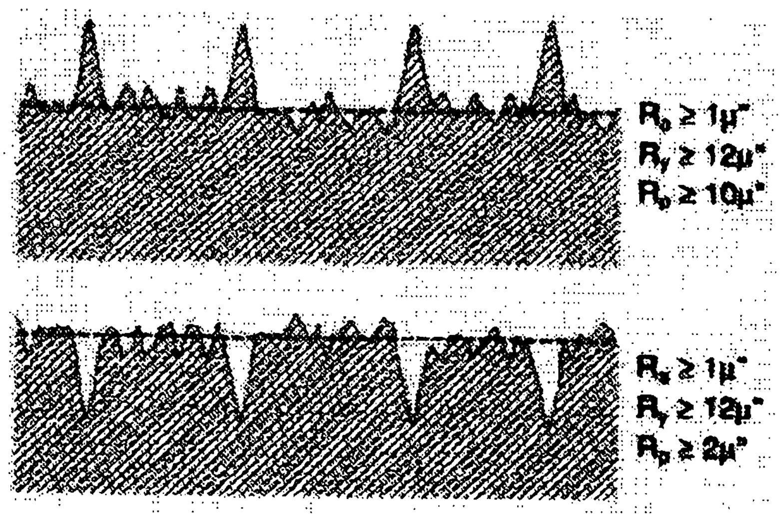
the workpiece itself as the reference surface.

Skidless gages use an internal precision surface as a reference. This enables skidless gages to be used for measurements of waviness and form, in addition to roughness.

Because the three basic forms of surface geometry are caused by different factors and tend to have different relationships to the performance of the part, it is common to separate them during analysis. This separation is achieved by the selection of filter or cutoff settings that allow the operator to select the degree of filtering that will be applied to the measured profile.



Here, two very different surfaces have the same Ra. Source: Mahr Federal Inc.

The irregularities of the machined surface consist of high and low spots created by the tool bit or by a grinding wheel. These peaks and valleys can be measured and used to define the conditions and sometimes the performance of the surface. There are more then 100 ways to measure a surface and analyze the results, expressed as parameters, but for most cases, only a few are specified. Each of the parameters has its own advantages and limitations. Often one parameter is incapable of

defining a surface adequately. Therefore, a complete definition of a surface often involves two or more parameters, and in some cases, the relationship or ratio of one parameter to another.

The most common parameter is Ra, or Arithmetic Average Roughness. It basically reflects the average height of roughness component irregularities from a mean line. Ra provides a simple value for accept/reject decisions. It is a default parameter on a drawing if not otherwise specified, and is available even in the least sophisticated instruments. Ra is not a good discriminator for different types of surfaces as it is incapable of differentiating between "spiky" and "scratched" surfaces having the same Ra. Additional parameters should be specified for this purpose, such as Rp (Maximum Peak Height), Rv (Maximum Valley Depth) and Ry (Maximum Peak-to-Valley Roughness Height).

In Europe, the more common parameter for roughness is Rz, or Mean Roughness Depth. It is the average distance between the highest peak and the deepest valley in five sampling lengths, or cutoffs. Rz is more sensitive then Ra to the changes in surface finish because maximum profile heights, and not the averages, are being examined. There is no firm conversion between Ra and Rz parameters, as the actual ratio depends upon the shape of profile, but the approximate ratio of Rz = x4 - x7Ra could be used.

Surface finish measurement procedures, general terminology, definitions of most parameters and filtering information can be found in American Standard ASME B46.1 - 2002, Surface Texture, and in International Standards, ISO 4287 and ISO 4288.